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SCIENCE.

FRIDAY, JULY 16, 1886.

COMMENT AND CRITICISM.

THE U. S. FISH COMMISSION is now well started in its summer work. Professor Baird and a party of a dozen scientific men and investigators are at Wood's Holl; the Albatross is in northern waters, engaged in dredging for marine life; the Fish Hawk has gone to St. Jeromes, on the Chesapeake; and the Lookout has been engaged for some time in the lower Chesapeake, conducting experiments in hatching crabs and Spanish mackerel. At St. Jeromes the principal work is in oyster-culture. At this season the spawning oysters are secured, and the spawn taken from them artificially by methods devised by Professors Ryder and Brooks. Perhaps the most significant features of the work of the commission this season, however, are the experiments in the propagation of crabs and Spanish mackerel, which bid fair to be as successful as those recently inaugurated at Wood's Holl in the artificial propagation of the lobster. One of the results of these experiments will be the transportation of millions of young crab to the Pacific coast, where, when once firmly established, they will add materially to the food-products of the waters of that section. Scientific experts on the commission state that no crab of the Pacific waters can ever take the place of the blue or edible crab of the Atlantic coast.

THE PASTEUR INSTITUTE in France is more successful in its appeals for financial aid than a similar institute organized for the same purpose in the city of New York. The French people have already contributed more than one million francs towards the perpetuation of the Paris institute, at which more than a thousand persons have been inoculated for the prevention of rabies, while we are informed that the support given to Dr. Mott for a similar purpose is so meagre that his work will probably be discontinued after a few weeks. The American people were willing to subscribe an unlimited amount to send a few children to Paris; but, now that an opportunity is given them to provide protection to the whole population of the United States, they fail to respond.

No. 180.—1886.

THE CONTROVERSY over the glacial origin of lake-basins has had a satisfactory termination in at least one case. Heim of Zurich has maintained the inefficiency of glacial erosion, and refused to admit that the Swiss or any other large lakes could have such an origin. Penck, lately of Munich, now in Vienna, has insisted that the Bavarian lakes were cut out by ice, and implied that Lake Zurich and many others were also. Last fall these two professors undertook a joint excursion, going together to the ground formerly examined by each one alone, and they found that their problems are really distinct. Heim now admits that the Bavarian lakes are, after all, most probably glacial excavations in gravel deposits; and Penck sees that dislocation has had an essential share in the formation of Lake Zurich, although ice may have given it the finishing touches. The concluding paragraph of their joint report, as translated in the *Geological magazine* for June, teaches a larger lesson than many controversialists have learned: "There is, therefore, no real difference of opinion between us, touching the Lake of Zurich and the lakes of the Bavarian highlands, either as regards the facts or the conclusions from them; and as in the present case, so also does it often happen, that, by a more exact conjoint examination, differences become of much less importance than they appear to be from a distance."

LADY FLORA WILMOT died at Swansea, Eng., after taking chloroform in a dentist's chair, for the extraction of a tooth. The anaesthetic was administered by a physician. The patient had taken chloroform twice before without any bad effects. In all, but two drams were used. All attempts to restore the patient by the use of nitrite of amyl and artificial respiration were of no avail. The physician remarked immediately after the extraction of the tooth, "I hate giving chloroform for you dentists, because you will have your patients sitting up." Both the dentist and the physician were exonerated by the jury which was called to hold an inquest. The evidences of the danger in the administration of chloroform are so overwhelming, except in a very few cases, that no one is justified at the present day in using

it in so simple an operation as the extraction of a tooth ; and a jury would be doing its full duty in holding responsible for the death of the patient any physician or dentist who administered it in such a case, with a fatal result.

ONE OF THE DIFFICULT problems which presents itself for solution in the south is how to reduce the mortality among the blacks. That it has not yet been solved is made evident by a study of the vital statistics of southern cities. These records show that the death-rate of the negroes is double that of the whites. Savannah, Ga., however, seems to be exceptionally unhealthy in this regard. It is stated that in that city, while the rate for the white population is but 12.19 per thousand, a remarkably low rate and probably not correct, that for the blacks is 122. If these figures are correct, there is opportunity for much missionary work of a sanitary nature in the city of Savannah.

ECONOMIC LAWS AND METHODS.

IF it should be said that the material out of which the science of mechanics was built was wood and stone, iron and steel, every one would see the mistake. But when Mr. H. C. Adams, in his interesting paper on economics and jurisprudence, speaks of the material surroundings of men and the legal structure of society as material out of which the science of economics is built, he falls into precisely the same error (*Science*, July 2).

It would be unfair to Mr. Adams personally to lay too much stress on a random expression torn from its context ; but it is not unfair to the school of thought to which he belongs. We have singled this expression out for criticism because it is characteristic of the school. It represents a view of the whole subject which is likely to lead to grave mistakes in thinking and in action. That Mr. Adams himself will make those mistakes, we do not believe. We should be sorry to say a word which should even seem to detract from the value of his work. He is one of the few men who combine originality with critical judgment. But the high character of the writer makes it all the more necessary to protest against his mistakes, even though they be but incidental. What he does inadvertently, others will be led to do deliberately.

The error lies in confounding the material to which a science is applied, with the material out of which it is built ; or — to put the same thing in another form — in identifying the material of a

science with the materials of an art. In itself this may seem a trivial matter ; in its consequences it is extremely serious.

The material out of which the science of mechanics is built is not wood or iron, in any sense whatever. The science is built out of a few simple laws of motion, nowhere *exactly* realized in nature, and yet now admitted by every sensible man to be true. And in like manner the material out of which the science of economics is built consists of a few simple laws of human nature, the chief of which is that men strive to obtain the maximum of satisfaction with the minimum of sacrifice. It does not insist that the sacrifice shall be solely physical, or the satisfaction purely material. It makes no more unwarranted assumptions than does pure mechanics. The 'economic man' has as much and as little real existence as the 'material point.' As the fundamental assumptions of mechanics are involved in the definition of motion and the fact of its measurement, so the fundamental assumptions of political economy are involved in the definition of motives, and the fact of their measurement. This measurement is far less accurate in moral science than in physical science : the danger of dogmatism is therefore greater, and the need for verification more constant. But to say that the verification *is* the science, is as much a mistake in the one case as in the other.

It is a mistake which is often made, and which does great harm, both in science and in practice. It defeats the usefulness of verification as a means of discovery. An illustration will help to make this clear. The discovery of Neptune was due to a study of the motions of Uranus. It was found that these motions were not exactly such as the laws of mechanics, applied to the position of the known planets, would explain. It was therefore assumed that there must be certain unknown conditions which entered into the case ; and careful reasoning led to the discovery of a new planet, whose position and size fulfilled those conditions.

Now, let it be observed, that, by the method which the historical school so highly commends, the inference from the motions of Uranus would simply have been that the law of gravitation *was not as rigid as is commonly supposed*. Such an inference would not merely have been wrong in itself, but it would have prevented the discovery of Neptune.

It is only when you assume a rigid law that your verification leads to new discoveries ; and it leads to the most fruitful discoveries where the law at first seems to fail. That these new discoveries may sometimes take such a form that the old statement of the law will need to be partly or wholly